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Work-Site Nutrition Intervention and Employees' Dietary Habits: The Treatwell Program

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ABSTRACT

In a randomized, controlled study of the Treatwell work-site nutrition intervention program, which focused on promoting eating patterns low in fat and high in fiber, 16 work sites from Massachusetts and Rhode Island were recruited to participate and randomly assigned to either an intervention or a control condition. The intervention included direct education and environmental programming tailored to each work site; control work sites received no intervention. A cohort of workers randomly sampled from each site was surveyed both prior to and following the intervention. Dietary patterns were assessed using a semiquantitative food frequency questionnaire. Adjusting for work site, the decrease in mean dietary fat intake was 1.1% of total calories more in intervention sites than in control sites ($P < .005$). Mean changes in dietary fiber intake between intervention and control sites did not differ. This study provides evidence that a work-site nutrition intervention program can effectively influence the dietary habits of workers. (*Am J Public Health.* 1992;82:877–880)

Introduction

This paper presents the results of a randomized study testing the efficacy of Treatwell, a work-site nutrition intervention program designed to promote dietary changes associated with the reduction of cancer risk. This program focuses on two dietary goals of the National Cancer Institute: reducing consumption of fat to 30% of total calories and increasing consumption of dietary fiber to 20 to 30 g per day.[1] The study tested the hypotheses that there would be a significant decrease in calories from fat and increase in grams of fiber consumed by employees of the intervention work sites compared with employees of control work sites.

Methods

Sixteen work sites from central Massachusetts and Rhode Island were recruited to participate in the study, described elsewhere.[2] Work sites ranged in size from 300 to 1400 employees, and each had a cafeteria with a kitchen. The work sites, stratified by size and distribution of employees by gender, were randomly assigned to an intervention or control condition. At intervention work sites, programs such as classes and food demonstrations were targeted to individuals, and cafeteria point-of-choice labeling programs provided environmental support. In addition, programs were tailored to each work site through an employee advisory board, and eating pattern guidelines provided consistent messages across intervention activities (Appendix 1). No intervention was provided at the control work sites.

A questionnaire was distributed prior to the intervention in summer 1988 (time 1) to 275 employees randomly selected from each work site. Respondents were surveyed a second time at the end of the intervention period (time 2). This survey included a 67-item semiquantitative food frequency questionnaire (FFQ) developed and validated by Willett and colleagues.[3] Employee characteristics, including sex, age, education, ethnicity, occupation, and body mass index (BMI), were also assessed.

One work site assigned to the intervention group elected not to participate in the intervention. Nevertheless, dietary changes of employees of all eight companies assigned to the intervention were compared with those of employees at the control sites. This approach permitted estimation of the overall effectiveness of this program in work sites that agreed to participate, regardless of their "compliance" with the program.

Analyses of the major outcomes were based on repeated measures analysis of variance using the SPSS-X software program.[4] In analyses, employee effects were

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This paper was submitted to the Journal February 20, 1991, and accepted with revisions August 22, 1991.

TABLE 1—Comparison of Characteristics Measured at Baseline between Time 1 Survey Nonrespondents and Subjects Completing Both Surveys

Characteristic	Time 1 Survey Nonrespondents (n = 840)	Responders Completing Both Surveys (n = 2011)	*P* Value
Age			
17–29	25.4	21.7	
30–54	60.0	62.9	
55–75	14.6	15.4	.11
Education			
High school graduate	41.1	36.2	
Some college	32.7	29.7	
College graduate	26.2	32.8	<.01
Sex (% male)	47.4	47.6	.46
Mean total fat (% cal.)[a]	34.1 (7.0)	34.0 (6.6)	.46
Mean total dietary fiber (g)[a]	14.55 (7.35)	14.43 (7.16)	.12

[a]Mean (standard deviation).

TABLE 2—Percentage of Employees Indicating That They Participated in Study Activities by Intervention Status

Study Participation Question	Intervention Companies (n = 947)	Control Companies (n = 1064)	*P* Value
Are you aware of a program where you work that teaches employees about nutrition?	67.4	10.5	<.01
Have you attended classes on diet, nutrition, or weight management where you work in last 12 months?			
Baseline	6.1	4.5	.16
Follow-up	16.6	4.4	<.01
Have you participated in any of the following types of events where you work in the last 12 months?			
Cholesterol screening	28.4	28.3	.99
Taste tests of healthy foods	28.9	0.6	<.01
Healthy barbecue	3.3	1.0	<.01
Recipe contest	1.7	0.7	.05
Party with healthy snacks	11.0	2.3	<.01

TABLE 3—Employee Characteristics by Treatment Status[a]

Employee Characteristics	Intervention Companies		Control Companies	
	Mean	SD	Mean	SD
Age, y	39.3	3.41	41.8	3.22
Education, y[b]	14.1	0.57	13.7	1.10
Ethnicity (% White)	94.0	6.01	96.4	2.70
Sex (% male)	43.2	14.93	50.8	21.67
Body Mass Index (mean)[c]				
Males	26.2	0.51	26.6	0.41
Females	24.4	0.66	24.3	0.78

Note. SD = standard deviation.
[a]None of the differences between treatment groups was found to be significant using analysis of variance.
[b]Education was measured on a six-category scale ranging from being less than high school graduate to having an advanced degree. The midpoint of each interval (in years) was used to estimate the mean.
[c]Body mass index = (weight in kg ÷ height in m^2).

nested within work-site effects. Mean values presented for each treatment condition represent the mean of the work-site mean values, thereby giving equal weight to each work site, which served as the unit of randomization and intervention.

Fat was expressed as a percentage of total calories because such a measure provides an intrinsic adjustment for caloric intake and directly addresses the public health message related to percent of calories as fat. It is a conservative measure in that the inflation of the numerator (i.e., fat calories) inflates the denominator by a numerically equivalent amount. Fiber values were transformed by the natural logarithm (ln) to comply with the assumptions of normality and homoscedasticity. Where summary mean scores are presented, we present the geometric mean.[5]

Results

A total of 3076 employees (70%, range: 52% to 93%) responded to the survey at time 1. Of those, 2258 (74%, range: 43% to 90%) returned the survey at time 2. Analyses were ultimately conducted on 2011 respondents for whom adequate data were available from both the time 1 and time 2 surveys.* No differences in baseline fat and fiber consumption, age, or sex were found between those who responded to both surveys and those responding only at time 1; however, those with more education were more likely to return the second survey (Table 1).

Significantly more intervention than control site employees reported that they were aware of a nutrition program at work and that they had attended classes at work on nutrition or weight management (see Table 2).

There were no statistically significant differences in baseline employee characteristics between the intervention and control work sites (see Table 3). Table 4 presents the relationship of these employee characteristics to total intake of dietary fat and dietary fiber (geometric mean), measured at baseline. As shown in the table, total dietary fat varied significantly by age, sex, and BMI; total dietary fiber varied significantly by age, sex, and education. The variability by work sites in mean changes in fat and fiber consumption are shown in Table 5.

There was a treatment-by-time effect for total dietary fat, and the decrease in

*At time 1, 211 questionnaires (7%) were eliminated from the analyses because there were more than 10 blank responses on the FFQ or because the reported daily caloric intake was less than 600 kcal or more than 4000 kcal, suggesting possible reporting errors. Similarly, 123 records were not included in the time 2 analyses for these reasons. Further information about the analyses is available upon request.

TABLE 4—Mean Baseline Level of Dietary Fat and Dietary Fiber by Employee Characteristics and Results of ANOVA Testing of Differences in Means

Employee Characteristic	Mean Total Dietary Fat (% cal.)	F Test (*df*)	*P* Value	Geometric Mean Total Dietary Fiber[a]	F Test (*df*)	*P* Value
Age						
17–35	34.1			12.56		
36–50	35.0			12.41		
51–75	33.3	7.86 (2, 1827)	<.01	14.19	9.96 (2, 1827)	<.01
Education						
High school	34.1			12.16		
Some college	33.9			13.32		
College graduate	34.2	0.37 (2, 1887)	.69	13.46	6.99 (2, 1887)	<.01
Ethnicity						
White	34.2			12.89		
Nonwhite	30.4	0.32 (1, 1908)	.57	16.14	0.01 (1, 1908)	.94
Sex						
Male	33.7			13.47		
Female	34.4	4.28 (1, 1901)	.04	12.37	12.15 (1, 1901)	<.01
Body Mass Index						
Underweight	34.2			11.95		
Acceptable weight	33.8			13.07		
Moderately overweight	33.9			13.13		
Obese	35.5			13.35		
Morbidly obese	37.6	2.50 (4, 1829)	.04	12.09	1.32 (4, 1829)	.26

Note. ANOVA = analysis of variance; *df* = degrees of freedom.
[a]Geometric mean for total dietary fiber intake derived by exponentiating the log value.

mean dietary fat was greater in intervention than in control work sites (Table 6). The decrease in total dietary fat was not affected by age, education, sex, BMI, or ethnicity (not shown in table). There was suggestion of a larger increase in mean dietary fiber among intervention than among control work sites. However, differences in total dietary fiber (ln) remained nonsignificant despite the inclusion of age, sex, education, BMI, and ethnicity in the model. Table 6 also presents the mean changes in fat and fiber after controlling simultaneously for age, sex, and education—the variables most likely to influence the effect of the intervention.

Discussion

This study is one of the first randomized controlled studies of a comprehensive work-site intervention promoting dietary change to reduce cancer risk.[6] The educational messages emphasized two changes: eat less fat and more fiber. The results indicate that the program was efficacious in reducing fat intake among employees of the intervention work sites.

There are many challenges inherent in work-site-based intervention research. In this study, three intervention sites experienced labor strikes and one moved to another location; similar changes did not occur in any of the control sites. One work site randomized to the intervention withdrew from the program although it did permit administration of the second survey. Thus, the program's overall effect was diluted by sites not fully implementing the program. Finally, the aim of 30% or less of calories from fat was not achieved. Nonetheless, we did observe an intervention effect for fat intake despite fluctuations in the degree to which the intervention was implemented.

TABLE 5—Mean and Standard Deviation for Changes in Dietary Fat and Dietary Fiber by Work Site

Work Site	n	Mean Change in Dietary Fat (% cal.) Mean	SD	Mean Change in Dietary Fiber (ln) Mean	SD	Geometric Mean Dietary Fiber[a]
Intervention companies						
1	78	–2.3	7.0	0.89	1.15	2.44
2	96	–1.2	6.4	1.04	1.19	2.83
3	118	–0.9	6.5	1.20	1.10	3.32
4	100	–2.5	7.7	1.20	0.95	3.32
5	192	–0.9	7.3	1.16	1.08	3.19
6	214	–2.3	6.6	1.24	1.13	3.46
7	73	–1.8	7.5	0.87	1.44	2.39
8	76	–1.6	7.6	1.28	1.06	3.60
Control companies						
1	151	–0.2	7.0	–0.138	1.20	2.86
2	157	–0.6	6.0	0.408	1.18	3.10
3	148	–1.0	6.5	0.736	1.12	3.10
4	78	–0.4	7.1	–0.133	1.11	2.59
5	152	–1.2	6.8	0.099	1.21	2.83
6	116	0.0	5.8	0.304	1.14	2.46
7	128	–1.2	6.6	–0.495	1.19	1.86
8	134	–0.3	7.4	0.950	1.17	3.10

Note. SD = standard deviation.
[a]Geometric mean for total dietary fiber intake derived by exponentiating the log value.

TABLE 6—Observed and Adjusted Changes in Dietary Fat and Dietary Fiber: Results of a Repeated Measures ANOVA

Outcome Variable	Intervention Companies			Control Companies			Treatment by Time F Test	*P* value (*df* = [1,14])
	Time 1	Time 2	Change	Time 1	Time 2	Change		
Total fat (% cal.):								
Observed means	34.3	32.6	–1.70	33.8	33.2	–0.60	12.41	<.01
Adjusted changes[a]			–1.20			–0.50	9.33	<.01
Total fiber (ln):								
Observed means	2.55	2.58	0.03	2.58	2.60	0.02	0.21	.66
Adjusted changes[a]			0.03			0.01	0.48	.50
Geometric means[b]	12.84	13.26		13.22	13.49			

Note. ANOVA = analysis of variance; *df* = degrees of freedom.
[a]Changes adjusted for differences between intervention groups in age, sex, and education.
[b]Geometric mean for total dietary fiber intake derived by exponentiating the log value.

The FFQ was used in this study because it can be self-administered, can be processed relatively rapidly and at a low cost, and can provide estimates of specific nutrient levels. However, it is subject to recall bias because respondents must average their intake of specified foods over a 12-month period. Assuming there is no intervention-related measurement bias, the FFQ can provide a reliable estimate of nutrient levels to be compared within this study between baseline and follow-up. Because the FFQ is associated with a bias in nutrient intake estimates, the results cannot be compared reliably with estimates derived from other types of dietary assessments. The lack of a significant fiber effect may also be a function of the measurement limitations, given that the FFQ may not provide a sensitive assessment of dietary fiber intake.[7]

In conclusion, this study provides some of the first evidence from a randomized controlled trial that a nutrition intervention program in work sites can have a significant impact on workers' eating behaviors. This employee-driven intervention program integrated individual behavioral change strategies with social and environmental support to produce dietary changes that are associated with reduced cancer risk. With growing evidence of the health implications of dietary habits, such strategies must be identified to promote healthy eating patterns not only among those at high risk but also among the entire population. □

Acknowledgments

This study was funded by the National Cancer Institute, Grant 5R01 CA46028.

The authors wish to thank the 16 participating work sites that made this study possible. The authors are also grateful to Dr. Karen Glanz and two anonymous reviewers for their helpful comments on earlier versions of this manuscript.

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APPENDIX—Treatwell Eating Pattern Guidelines

TRIM FAT

Choose fish, skinned turkey and chicken, and trimmed lean red meat. Keep the amount at six ounces or less, cooked, a day.
Choose low-fat dairy products: skim, 1%, or 2% milk; low-fat yogurt; ice milk; and low-fat cheeses.
Use half the amount of fat or oil you normally use in cooking and baking, and at the table.

ADD FIBER

Eat at least one serving of high-fiber cereal every day.
Eat one or more servings of fruit at each meal and for snacks.
Eat one or more servings of vegetable at lunch and dinner.
Eat at least one of these foods at each meal:
Whole-grain bread, rice and/or pasta, potato
Dried beans, peas, or lentils